FINAL SITE INSPECTION PRIORITIZATION REPORT
FOR
MCFETTRIDGE FARM
MILLIS, MASSACHUSETTS

Prepared For:
U.S. Environmental Protection Agency
Region I
Office of Site Remediation and Restoration
John F. Kennedy Federal Building
Boston, MA 02203-0001

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16 September 1998

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Work Order No. 11098-031-001-5118-70

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Millis, Massachusetts

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INTRODUCTION

The Roy F. Weston, Inc. (WESTON®) Superfund Technical Assessment and Response Team (START) was requested by the U.S. Environmental Protection Agency Region I (EPA Region I), Office of Site Remediation and Restoration to perform a Site Inspection Prioritization (SIP) of the McFettridge Farm site at 63 Grove Street in Millis, Massachusetts. Tasks were conducted in accordance with the SIP scope of work and technical specifications provided by EPA Region I. In 1984, Massachusetts Department of Environmental Quality Engineering [MA DEQE, presently Massachusetts Department of Environmental Protection (MA DEP)] contractors conducted remedial activities including the removal of 1,800 drums and 60 cubic yards (yd^3) of contaminated soil from the McFettridge Farm site. An EPA Site Inspection (SI) Report was prepared by MA DEQE for the McFettridge Farm site; however, only portions of this document were available in the materials reviewed by START personnel during this investigation. Based on the information provided in the SI report, the McFettridge Farm SIP was initiated.

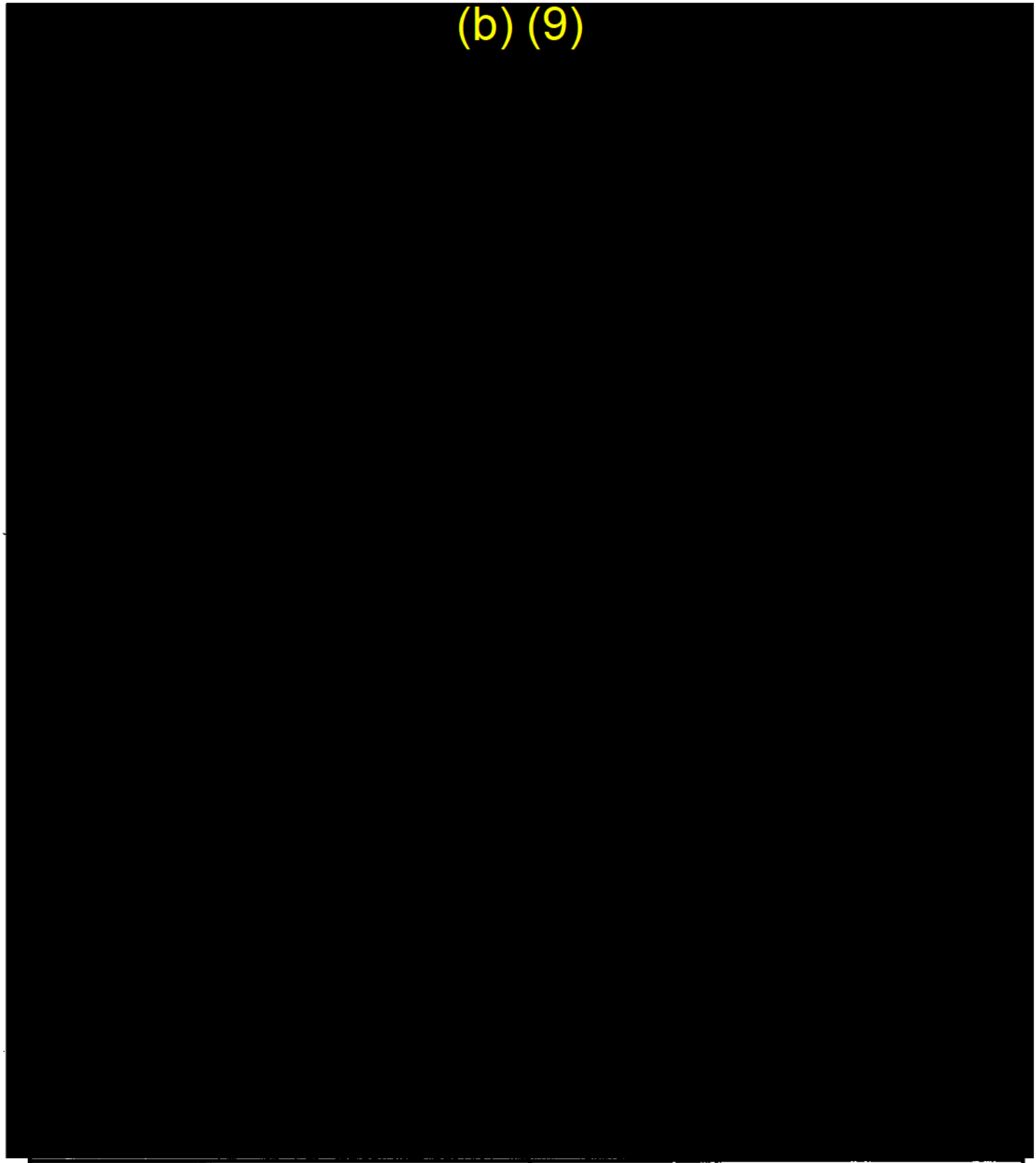
Background information used in the generation of this report was obtained through file searches conducted at the EPA Region I and MA DEP, telephone interviews with town officials, conversations with persons knowledgeable of the McFettridge Farm site, conversations with other Federal, State, and local agencies, and on-site reconnaissance and sampling activities.

This package follows the guidelines developed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, commonly referred to as Superfund. However, these documents do not necessarily fulfill the requirements of other EPA Region I regulations such as those under the Resource Conservation and Recovery Act (RCRA) or other Federal, State, or local regulations. SIPs are intended to provide a preliminary screening of sites to facilitate EPA Region I's assignment of site priorities. They are limited efforts and are not intended to supersede more detailed investigations.

SITE DESCRIPTION

The McFettridge Farm site (the site) is located on Grove Street in Millis, Norfolk County, Massachusetts (Figure 1). Geographic coordinates for the site are latitude 42° 10′ 50" north and longitude 71° 23′ 47" west. The McFettridge Farm site encompasses approximately 5 to 10 acres, and according to the Town of Millis Tax Assessor's Map, corresponds with portions of Plate 5, Lots 4, 6-6, and 7, and a portion of Plate 13, Lot 7. A small portion of the site (Plate 5, Lot 7) is owned by Mr. Arthur McFettridge. The McFettridge Farm site allegedly includes portions of the adjacent properties owned by Mr. Robert Graci, Mr. Domenic Tiberi, and Mr. Steven Turk (Figure 2) [1]. At the present time, no known land survey of the site has been conducted in order to determine the exact location of the site relative to the properties on which it is situated. Consequently, property lines in areas of concern are presently under dispute by the aforementioned property owners.

(b) (9)



LOCATION MAP

McFETTRIDGE FARM
63 GROVE STREET
MILLIS, MASSACHUSETTS

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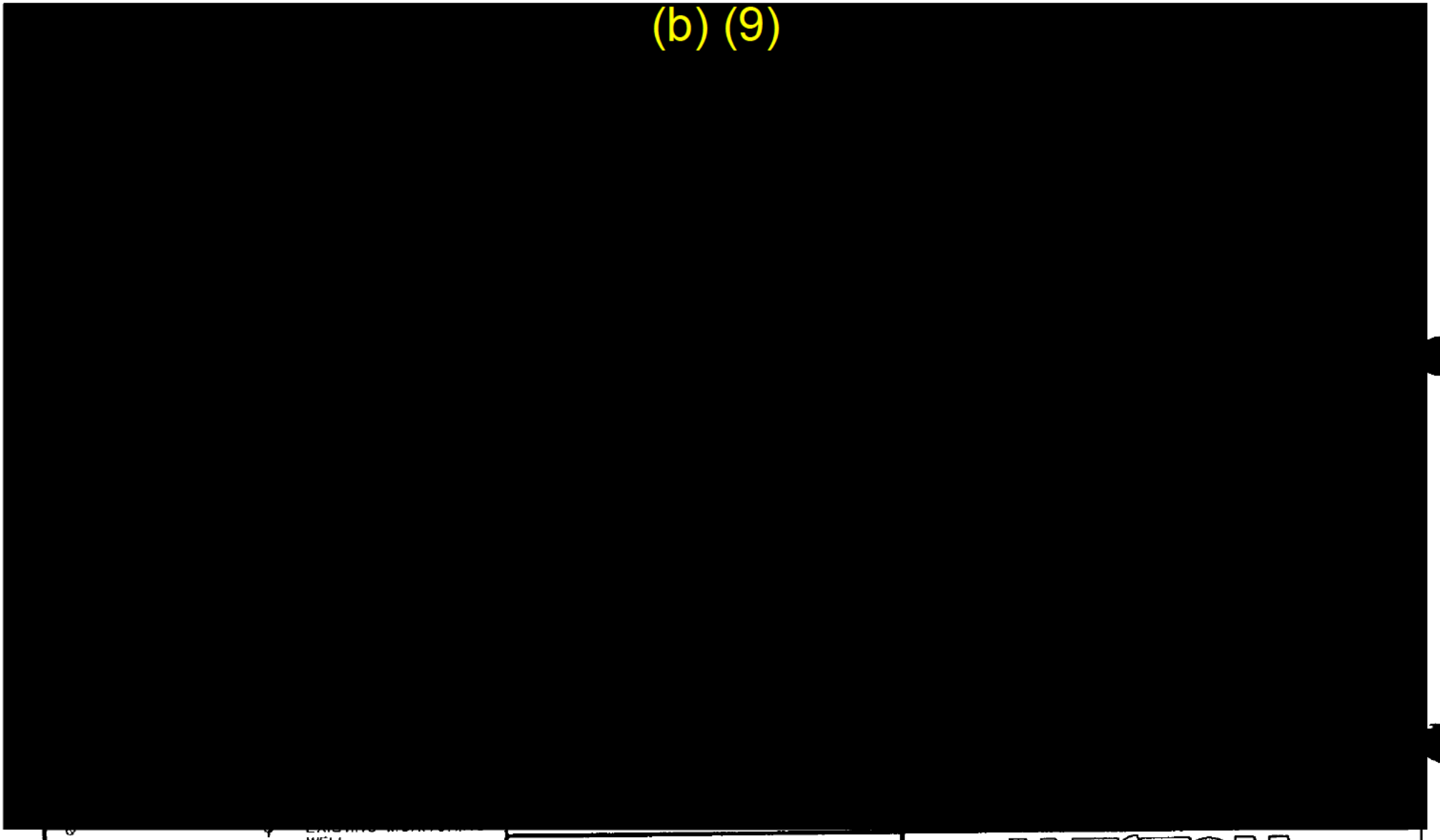
FILE NAME: 95070050\FARM1.DWG

FIGURE 1

(b) (9)



EXISTING STONE WALL

RESIDENCE

PREVIOUS DRUM REMOVAL AREA

WOODED AREA

WETLANDS

WELL

EXISTING DOMESTIC WATER SUPPLY WELL

PROBABLE POINT OF ENTRY TO SURFACE WATER

WATER

GROUNDWATER FLOW DIRECTION

SITE SKETCH

McFETTRIDGE FARM

63 GROVE STREET

MILLIS, MASSACHUSETTS

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FIGURE 2

16 September 1998

Portions of the above-referenced properties were allegedly utilized by Mr. Arthur McFettridge (without the other owners' consent) as a disposal area for drums and other miscellaneous wastes for 15 years [3, p. 2].

The property referred to as Plate 13, Lot 7, was purchased from Mr. Tiberi by Mr. John Rosata of the Bogastow Brook Realty Trust, Medford, Massachusetts, in 1988. It was then purchased by Mr. Turk in February 1990 from the Bogastow Brook Realty Trust. The property is currently being subdivided into several smaller residential lots [28, p. 3; 35, pp. 1-9]. Table 1 lists the current owners of the individual lots which comprise the McFettridge Farm site.

Table 1

Current Owners of the McFettridge Farm Site

Tax Assessor Plate/Lot Nos.	Owners Name	Address\ Telephone Number	City/State
Plate 5, Lot 7	Arthur McFettridge	63 Grove Street\ (b) (6)	Millis, Massachusetts
Plate 5, Lot 6	Domenic Tiberi	53 Grove Street\ (b) (6)	Millis, Massachusetts
Plate 5, Lots 4 and 6-6	Robert Graci	101 Orchard Street\ (b) (6)	Millis, Massachusetts
Plate 13, Lot 7	Steven Turk	43 Grove Street\ (b) (6)	Millis, Massachusetts

[1]

The McFettridge Farm site and surrounding area is zoned for residential use [2]. The site is bound to the north by Orchard Street and an unnamed stream, to the south by a horse farm and residential properties along Causeway Street, to the east by Bogastow Brook, and to the west by residential properties along Grove Street (Figure 2) [35, p. 5].

The topography of the McFettridge Farm site is generally flat, sloping gently to the east, with an average elevation of approximately 150 feet (ft) above mean sea level. Most of the site is heavily vegetated. A sand and gravel pit is located along the southern boundary of the McFettridge Farm site [3, p. 2].

On 9 May 1996, START personnel conducted an on-site reconnaissance of the McFettridge Farm site. START personnel observed that the area surrounding the McFettridge residence contained discarded household appliances, large trash receptacles, and other interspersed trash/debris piles [35, pp. 1-5].

START personnel observed that the portion of the site owned by Mr. Graci was overgrown with thick woodland vegetation. START personnel also observed a large debris pile extending along the eastern portion of Mr. McFettridge's portion of the site and extending onto the adjacent lots owned by Mr. Graci and Mr. Turk. The pile contained discarded automobile tires, sheets of linoleum, miscellaneous trash/debris, and soil material. Based on available information and site maps, this pile apparently represents the drums and contaminated soil from the northern drum area that was left to remain on the site upon completion of the MA DEQE remedial action conducted in 1985 [35, pp. 1-5].

START personnel conducted a reconnaissance of Mr. Turk's portion of the site, and observed that the northern portion of Mr. Turk's property (which abuts the McFettridge and Graci properties) was overgrown with woodland vegetation. In addition, START personnel observed scattered trash/debris piles throughout that portion of the property. The trash/debris piles included rusted 55-gallon drums, various size cylinders (propane, oxygen, and acetylene), discarded automobile parts and tires, recreational vehicles (campers/trailers), construction trailers, carpeting, large trash receptacles, and a stockpile of scrap metal including discarded household appliances. START personnel were unable to determine whether or not the drums and gas cylinders observed were empty [35, pp. 1-5].

The southern portion of Mr. Turk's property was observed to be in the preliminary phase of construction for a housing development. This was evident by portions of the site being cleared and regraded and by the presence of soil percolation test holes and survey markers. START personnel also observed a 1,000-gallon oil aboveground storage tank (AST) in the southern portion of Mr. Turk's property. Mr. Turk informed START personnel that the AST was used to fuel construction vehicles and would be removed from the site when the housing development was completed. Upon further inspection by START personnel, the AST was observed to be empty with no sign of staining around the base or in the vicinity of the AST [35, pp. 1-5].

START personnel observed eight residential supply wells and one flush-mounted monitoring well along the southwestern portion of Mr. Turk's property, to the south of Grove Street. Based on a figure prepared by the Massachusetts Field Investigation Team (Mass FIT), entitled "McFettridge Site Phase II Site Investigation Figure 1," START assumes that the monitoring well is located in the approximate area of the southern drum area [48]. The figure was likely drafted for a Phase II work plan which was prepared by Mass FIT but was never implemented [49]. START did not observe any other evidence of the southern drum area [35, pp. 1-5].

START personnel observed four 3-inch diameter polyvinyl chloride (PVC) monitoring wells (two of which had sealed covers) in the rubbish/soil scrap metal pile area. START personnel were unable to identify the well numbers or the presence of additional wells. In addition, START personnel were unable to identify the former locations of test pits that were excavated in 1984 by Clean Harbors, Incorporated in conjunction with Camp, Dresser, and McKee, Incorporated (CHI/CDM) [11; 35, pp. 1-5].

OPERATIONAL AND REGULATORY HISTORY AND WASTE CHARACTERISTICS

Based on MA DEP file information, portions of each of the aforementioned lots have been utilized as a disposal area by McFettridge, Inc., a trash collection service in Millis owned by Mr. McFettridge [5]. The dumping reportedly occurred without knowledge or consent from the other property owners [51]. Wastes were disposed of on site for approximately 15 years and included paints, pigments and dyes, latex, linoleum, oil, oil-contaminated soil, aqueous organics, ammonia, and other sludges, along with other flammable liquids and solids [3, p. 2; 16].

According to a letter written by Mr. Graci, dated 6 October 1983, Mr. McFettridge disposed of waste on the Graci property in the spring of 1975 [9].

In June 1983, the Millis Board of Health (BOH) reportedly received anonymous complaints in reference to potential hazardous waste disposal activities occurring on the McFettridge Farm site [3, p. 1].

On 27 June 1983, Ms. Margaret Clark, a representative of the BOH, visited the site. During her visit, Ms. Clark reported observing several barrels and drums located on the site. Ms. Clark visited the site again on 28 June 1983 and observed some drums with "caustic soda" labels [5].

On 29 June 1983, Ms. Clark and Mr. Joshua Maeo of the BOH and Mr. David Chapman of MA DEQE inspected the section of the site owned by Mr. McFettridge and a sand and gravel pit located on the abutting property (then owned by Mr. Tiberi). A total of 50 55-gallon drums were observed containing liquids and solid materials. Mr. Chapman noted that the majority of the drums were rusted and corroded, with some drums showing signs of leakage. It was also noted that the drums labelled "caustic soda", which were observed on 28 June 1983 by Ms. Clark, were no longer on site [5].

In a letter dated 30 June 1983, the BOH ordered Mr. McFettridge not to remove any drums, other metal containers, or soil from the site until otherwise directed by the BOH [6].

At the request of the BOH, MA DEQE conducted a preliminary investigation to determine if the McFettridge and adjacent properties were contaminated with chemical waste products [7]. In a letter dated 12 August 1983, MA DEQE concluded that, based on observations made during the preliminary investigation, additional studies were necessary to determine the exact nature and extent of contamination and/or contaminant migration from the site. In addition, the letter required Mr. McFettridge's remedial contractor (Franklin Pumping Services, Inc.) to submit a written site problem definition as required by the Massachusetts Oil and Hazardous Materials Release Prevention and Response Act [7]. START personnel were unable to locate additional records which revealed the outcome of the MA DEQE request.

MA DEQE determined that there was a release/threat of hazardous materials at the McFettridge Farm site [10]. According to a MA DEQE memorandum, a Notice of Responsibility (NOR) issued by MA DEQE required Mr. McFettridge to have the drums removed from the site [3, p. 1]. Mr. McFettridge was deemed responsible by MADEQE for the removal and proper disposal

of the waste at the site and for a comprehensive site investigation to determine the nature, extent, and impact of any improper hazardous waste disposal at the site [10].

In a Notice of Departmental Action, dated 21 November 1983, MA DEQE stated that, since Mr. McFettridge had not initiated any of the required activities, MA DEQE would move ahead with remedial actions at the site using State funds and would then seek to recover the costs from Mr. McFettridge [10]. Subsequently, MA DEQE assigned their emergency response contractors, CHI/CDM, to begin remedial activities on the McFettridge Farm site [3, p. 1].

In December 1983, the McFettridge Farm site was listed on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) by EPA Region I. According to MA DEQE file information, remediation activities began at the site on 1 August 1984. Approximately 1,800 drums and 60 yd^3 of contaminated soil were removed from the McFettridge Farm site and transported to the Evergreen Landfill, a licensed waste disposal facility in Ohio, for proper disposal [3, p. 1]. In addition, approximately 500 empty drums and 5,000 yd^3 of rubbish and soil (which passed extraction procedure toxicity (EP Tox) analysis) were left on site [3, p. 1]. Table 2 summarizes drum compatibility categories for drums removed from the McFettridge Farm site as determined by Chemical Waste Management of Massachusetts, Inc. [49].

Table 2

Drum Compatibility Categories for Drums Removed from the McFettridge Farm Site

Category	Description	Quantity of Drums
1	Paint - Inert	123
2	Paint - Possibly Flammable	138
3	Pigments and Dyes	170
4	Pigments and Dyes - Possibly Flammable	42
5	Latex - Inert	81
6	Latex - Possibly Flammable	95
7	Inert Solids	259
8	Inert Solids - PID readings >20 Units above background	129
9	Resin - Inert	25
10	Resin - Possibly Flammable	28
11	Liquid and Solids	26
12	Liquid and Solids - PID readings >20 Units above background	21
13	Flammable Liquid	23
14	Tar and Black Sludge	44

Table 2

Drum Compatibility Categories for Drums Removed from the McFettridge Farm Site (Concluded)

Category	Description	Quantity of Drums
15	Flammable Solid	85
16	Oil-Contaminated Soil	5
17	Oil	10
18	Ammonia Sludge	3
19	Aqueous Organics	7
20	Liquids	9
21	Linoleum - Inert	14
22	Linoleum - Possibly Flammable	2
--	Miscellaneous	449
Total Drums		1,793

PID = Photoionization Detector

[49]

On 2 and 3 August 1984, CHI/CDM excavated four test pits (Test Pit Nos. 1 through 4) in the northern drum area under the supervision of MA DEQE. Two groundwater monitoring wells, consisting of 3-inch diameter PVC pipes with slotted ends and bottom plugs, were installed in two of the test pits [16, pp. 2-3].

CHI/CDM collected a groundwater sample from each of the two test pits. The samples were analyzed for volatile organic compounds (VOCs), total metals, and cyanide. Analytical results indicated elevated concentrations of lead and chromium which exceeded drinking water limits, according to CHI/CDM. Analytical results also indicated elevated concentrations of two VOCs: ethyl benzene and toluene [16, p. 5].

On 15 August 1984, CHI/CDM excavated three additional test pits (Test Pit Nos. 1A, 2A, and 3A) in the northern drum area and installed a groundwater monitoring well in each test pit [12]. The exact location of these test pits could not be determined by START personnel.

On 22 August 1984, groundwater samples were collected from the three wells associated with the northern drum area. The samples were analyzed for total metals, total cyanide, total phenol, VOCs, and base/neutral and acid (BNA) extractables. Lead was the only metal that exceeded drinking water limits according to CHI/CDM. Total phenol was detected in two of the three wells. One well also contained concentrations of ethyl benzene, toluene, and phenol [16, p. 9]. Well locations could not be determined from available file information.

On 27 August 1984, CHI/CDM collected groundwater samples from seven private residential drinking water wells in the Town of Millis for VOC analysis. Four residential well samples were collected from residences located at 26, 36, 50, and 140-2 Causeway Street; two residential well samples were collected from residences located at 53 and 70 Grove Street; and one residential well sample was collected from 109 Orchard Street. No VOCs were detected in any samples collected from these private residential drinking water wells [16, p. 10].

On 4 September 1984, a composite soil sample was collected by CHI/CDM from material accumulated in a contaminated soil pile in the vicinity of the northern drum area. The sample was analyzed for EP Tox metals, flashpoint, oil, grease, and total solids. Analytical results indicated that concentrations of extractable metals within the sample did not exceed EP Tox regulatory limits [16, p. 11].

On 5 September 1984, CHI/CDM collected two additional residential well samples for VOC analysis. The samples were collected from 63 Grove Street (the McFettridge residence) and 20 Causeway Street. No VOCs were detected in samples from either of the two residential drinking water wells [16, p. 11].

In April 1985, the BOH voted to designate the site a solid waste landfill, indicating that the site should be prepared for closure [47, p. 1].

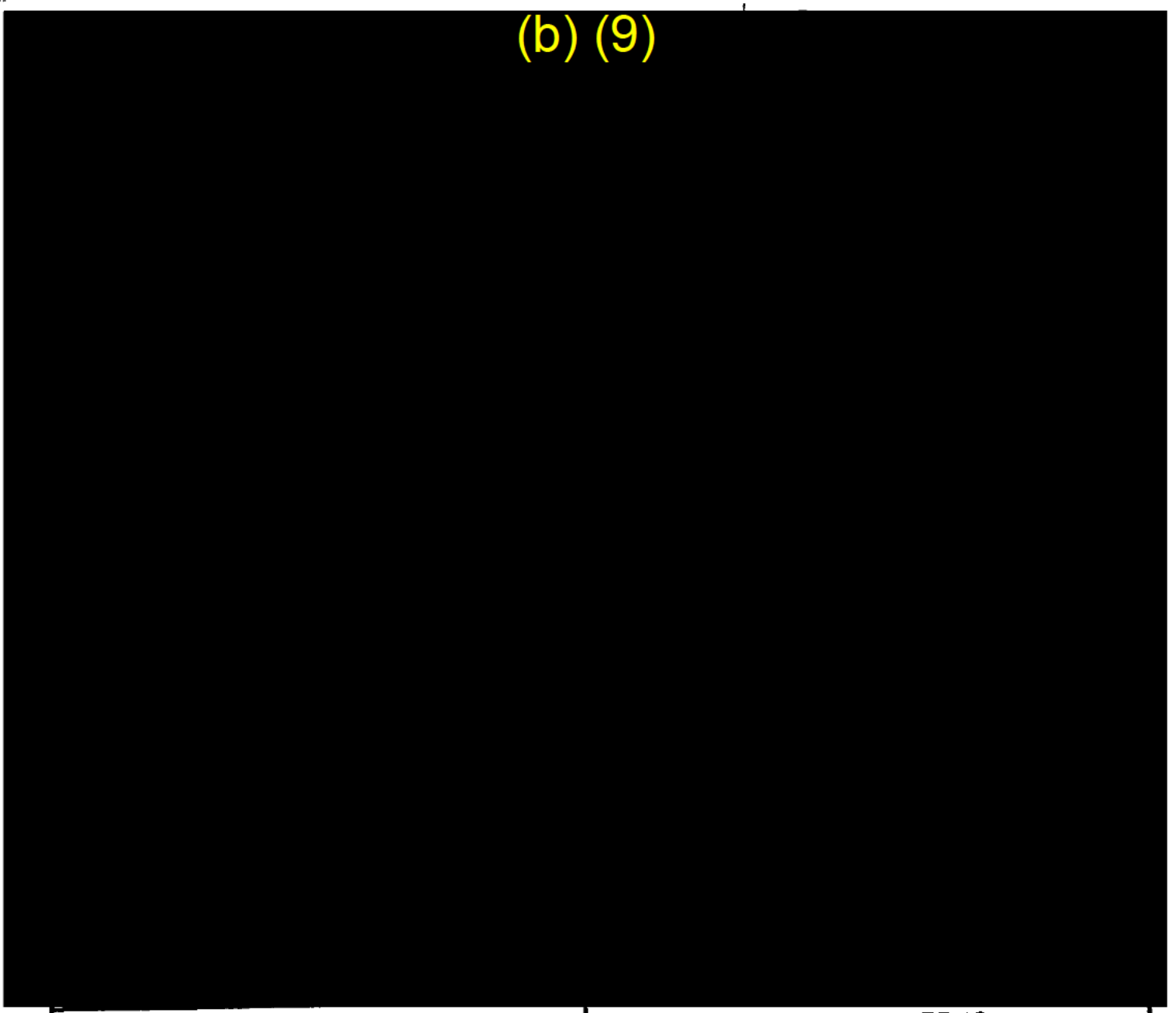
In March 1989, TGG Environmental, Inc. (TGGE) was contracted by the Bogastow Brook Realty Trust to prepare an environmental site assessment report to assess the potential impact of the waste disposal site on groundwater supplies for the planned housing development in the vicinity of the McFettridge Farm site [28].

Gas chromatograph (GC) screening of a groundwater sample collected from an observation well located in the debris pile indicated the presence of several VOCs (most likely toluene and ethyl benzene, according to TGGE) [28, p. 6]. Based on a TGGE figure, this well is probably either GW-06 or GW-02 (Figure 2) [28, Figure 2].

Groundwater samples from another well reportedly located in the debris pile were sent to an analytical laboratory for VOC and total petroleum hydrocarbons (TPH) analyses. VOCs were not detected; however, low levels of TPH were detected [28, p. 6].

On 15 January 1997, START personnel conducted sampling activities at the McFettridge Farm site. A total of 19 environmental samples were collected from surface soil, sediment, drinking water, and groundwater locations on and near the site (Figure 3). START samples were submitted for VOC, semivolatile organic compound (SVOC), pesticide/ polychlorinated biphenyl (PCB), and inorganic (total metals and cyanide) analyses through the EPA Contract Laboratory Program (CLP). Groundwater and residential well samples were analyzed for low level VOCs by EPA Region I Modified Method 524.2 through a Delivery of Analytical Services (DAS) laboratory. Elevated levels of VOCs, SVOCs, pesticides/PCBs, and inorganic elements were detected in soil samples and sediment samples. VOCs, SVOCs, and inorganic elements were detected in the groundwater samples. Additionally, VOCs and inorganic elements were detected in residential drinking water samples.

(b) (9)



LEGEND

- PROBABLE POINT OF ENTRY
- SAND AND GRAVEL PIT
- RESIDENCE
- PREVIOUS DRUM REMOVAL AREA
- WOODED AREA
- WETLANDS
- SITE BOUNDARY
- EXISTING MONITORING WELL
- EXISTING DOMESTIC WATER SUPPLY WELL
- WATER
- EXISTING STONE WALL
- GROUNDWATER FLOW DIRECTION

LEGEND OF DISPOSED ITEMS

- (A) RUBBISH/SOIL SCRAP METAL PILE
- (B) CABIN
- (C) DEBRIS PILES
- (D) TRUCK
- (E) CAR
- (F) SHED
- (G) SCRAP METAL PILE
- (H) R.V. TRAILER
- (I) WOOD/SCRAP METAL PILE
- (J) DOG PEN
- (K) 1,000-GALLON AST
- (L) METAL DEBRIS (4 ENGINES)
- (M) EXCAVATION PIT/EQUIPMENT STORAGE
- (N) EQUIPMENT STORAGE

SAMPLE LOCATION SKETCH

McFETTRIDGE FARM
63 GROVE STREET
MILLIS, MASSACHUSETTS

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S:\95070050\FARM6	FIGURE 3

Further information on analytical results are discussed in the waste/source sampling, groundwater, and surface water pathway sections of this report.

Table 3 presents identified structures or areas on the McFettridge Farm site that are documented or potential sources of contamination, the containment factors associated with each source, and the relative location of each source.

Table 3

Source Evaluation for McFettridge Farm Site

Source Area	Containment Factors	Spatial Location
Northern drum area pile	None	Northwestern portion of the site.
Scattered debris pile	None	Northern portion of the site.
1,000-gallon AST	None	Central portion of Plate 13, Lot 7.
Drum area contaminated soil	None	Northwestern portion of the site.
Drum removal areas	None	Northern and southern drum areas.

AST = Aboveground Storage Tank

[35, pp. 1-5]

Table 4 summarizes the types of potentially hazardous substances which have been disposed, used, or stored on the McFettridge Farm site.

Table 4

Hazardous Waste Quantity for McFettridge Farm Site

Substance	Quantity or Volume/Area	Years of Use/Storage	Years of Disposal	Source Area
VOCs	unknown	unknown	unknown	Contaminated soil
SVOCs	unknown	unknown	unknown	Contaminated soil
Pesticides/PCBs	unknown	unknown	unknown	Contaminated soil
Inorganics	unknown	unknown	unknown	Contaminated soil

VOC = Volatile Organic Compounds
PCB = Polychlorinated Biphenyls
SVOC = Semivolatile Organic Compounds

[31-34]

No properties listed under CERCLIS have been identified within 4-radial miles of the McFettridge Farm site. However, four known Resource Conservation and Recovery Information System (RCRIS) facilities are located within 1-radial mile of the site [23; 24].

WASTE/SOURCE SAMPLING

On 4 September 1984, a composite sample was collected by CHI/CDM from material contained within a soil pile in the vicinity of the northern drum area. The sample was analyzed for EP Tox metals, flashpoint, oil, grease, and total solids. Analytical results of the sample indicated that the metals did not exceed EP Tox regulatory limits; flashpoint was shown to be greater than 200 °F; and the sample contained 1.25% oil and grease [16, p. 11].

On 29 March 1989, TGGE conducted headspace screenings for total VOCs on soil samples collected from borings on the Turk portion of the site. VOC headspace screening results indicated PID readings ranging between 0.7 and 2.2 units above background for soil samples collected from depths of 0 to 17 feet [28, Appendix D]. The maximum concentration was detected in a sample collected from a depth of 0 to 2 feet [28, Appendix D].

During the START sampling event of 15 January 1997, START personnel collected five source/surface soil samples from the McFettridge Farm site (SS-01 through SS-05) (Figure 3). Source/soil sample SS-04 was utilized as the reference source/soil samples due to the relatively low contaminants concentrations. START soil samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and inorganic elements (metals and cyanide) through the EPA Contract Laboratory Program (CLP). Quality Assurance/Quality Control (QA/QC) consisted of the collection of a trip blank, a rinsate blank, and a Matrix Spike/Matrix Spike Duplicate (MS/MSD) sample [35, pp. 6-9]. Table 5 summarizes source/surface soil samples collected by START personnel from the McFettridge Farm site.

Table 6 is a summary of organic compounds and inorganic elements detected through CLP analyses of START source/soil samples. For each sample location, a compound or element is listed if it is detected at three times or greater than the reference sample concentration SS-04. However, if the compound or element is not detected in the reference sample, the reference sample's quantitation limit (SQL) (for organic analyses) or sample detection limit (SDL) (for inorganic analyses) is used as the reference value. These compounds or elements are listed if they occurred at a value equal to or greater than the reference sample's SQL or SDL and are designated by their approximate relative concentration above these values. During data validation, phenanthrene was reported below the acceptable limit for performance evaluation (PE) samples (Action Low). Consequently, non-detected results for this compound were rejected. Therefore, the Contract Required Quantitation Limits (CRQLs) for the rejected analyses were used as reference values [33].

Complete analytical results of START source/soil samples including quantitation and detection limits are presented in Attachment A. Sample results quantified with a "J" on analytical tables are considered approximate because of limitations identified during CLP data validation. In addition, organic sample results reported at concentrations below quantitation limits and confirmed by mass spectrometry are also qualified by a "J" and considered approximate [33; 34].

Table 5

Sample Summary: McFettridge Farm Site
Source/Soil Samples Collected by START on 15 January 1997

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Soil					
SS-01	AMM86 MAKF61	1545	Grab	0 to 20 inches	Soil sample collected on the eastern edge of potential source area (debris pile) located on Plate 13, Lot 7 section of the site, approximately 25.7 feet east of sample location GW-05, bearing north 350°. The material is moist, dark, coarse sand with a mixture of debris material including pieces of linoleum; PID reading = 0 units above background.
SS-02	AMM87 MAKF62	1505	Grab	0 to 12 inches	Soil sample collected from within potential source area (debris pile) on Plate 13, Lot 7 section of the site, approximately 49.8 feet southwest of sample location GW-02, bearing north 98°. The material is moist, dark gray, coarse sand with pieces of linoleum, gravel, and other debris; PID reading = 0 units above background.
SS-03	AMM88 MAKF63	1445	Grab	0 to 12 inches	Soil sample collected from the northern drum area, southeast of Plate 5, Lot 7 residence on Plate 13, Lot 7 property, approximately 100 feet southwest of sample location SS-02, bearing north 235°. The material is moist, dark brown, fine sand, loam mixed with gravel, and pieces of metal; PID reading = 0 units above background.
SS-04 (MS/MSD)	AMM89 MAKF64	1405	Grab	0 to 12 inches	Soil sample collected south of Plate 13, Lot 7 property, approximately 30.7 feet north of the 1,000-gallon AST, bearing north 171.5°. The material is moist, brown, sandy loam with trace roots; PID reading = 0 units above background.
SS-05	AMM90 MAKF65	1627	Grab	0 to 12 inches	Soil sample collected in an area on Plate 5, Lots 4 and 6-6 property, east of Grove Street and south of the unnamed stream. The material is moist, dark, fine sand with trace roots; PID reading = 0 units above background.

MS/MSD = Matrix Spike/Matrix Spike Duplicate.
PID = Photoionization Detector.
AST = Aboveground Storage Tank.

[35]

Table 6

Summary of Analytical Results, Source/Soil Sample Analysis for McFettridge Farm Site

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments
SS-01 (AMM86) (MAKF61)	**SVOCs**			
	Butylbenzylphthalate	5,000 J µg/kg	370 U µg/kg	13.5 × SQL
	Di-n-octylphthalate	3,000 J µg/kg	370 U µg/kg	8.1 × SQL
	PESTICIDES/PCBs			
	delta-BHC	2.4 J µg/kg	1.8 U µg/kg	1.3 × SQL
	4,4'-DDE	25 J µg/kg	1.5 J µg/kg	16.7 × REF
	4,4'-DDD	400 µg/kg	3.6 U µg/kg	111.1 × SQL
	4,4'-DDT	1,800 µg/kg	1.2 J µg/kg	1,500 × REF
	alpha-Chlordane	2.8 J µg/kg	1.8 U µg/kg	1.6 × SQL
	gamma-Chlordane	1.9 J µg/kg	1.8 U µg/kg	1.1 × SQL
	INORGANICS			
	Barium	68.4 mg/kg	12.5 mg/kg	5.5 × REF
	Cadmium	3.2 J mg/kg	0.22 U mg/kg	14.6 × SDL
	Calcium	18,000 mg/kg	1,100 mg/kg	16.4 × REF
	Chromium	71.7 mg/kg	14.6 mg/kg	4.9 × REF
	Copper	67.7 mg/kg	13.6 mg/kg	5.0 × REF
	Lead	842 J mg/kg	10.7 J mg/kg	78.7 × REF
	Magnesium	8,950 mg/kg	1,740 mg/kg	5.1 × REF
	Mercury	4.4 mg/kg	0.11 UJ mg/kg	40 × SDL
	Nickel	45.8 mg/kg	12.0 mg/kg	3.8 × REF
	Silver	1.3 J mg/kg	0.45 U mg/kg	2.9 × SDL
	Vanadium	114 mg/kg	17.3 mg/kg	6.6 × REF
	Zinc	569 mg/kg	30.9 mg/kg	18.4 × REF
	Cyanide	1.1 J mg/kg	0.39 U mg/kg	2.8 × SDL

Table 6

Summary of Analytical Results, Source/Soil Sample Analysis for McFettridge Farm Site (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments
SS-02 (AMM87) (MAKF62)	**SVOCs**			
	1,4-Dichlorobenzene	1,700 J µg/kg	370 U µg/kg	4.6 × SQL
	1,2,4-Trichlorobenzene	1,700 J µg/kg	370 U µg/kg	4.6 × SQL
	Acenaphthene	2,600 J µg/kg	370 U µg/kg	7.0 × SQL
	Phenanthrene	2,000 J µg/kg	330 µg/kg	6.1 × CRQL
	Fluoranthene	3,600 J µg/kg	370 U µg/kg	9.7 × SQL
	Pyrene	4,300 J µg/kg	370 U µg/kg	11.6 × SQL
	Butylbenzylphthalate	4,600 J µg/kg	370 U µg/kg	12.4 × SQL
	Benzo(a)anthracene	1,400 J µg/kg	370 U µg/kg	3.8 × SQL
	Chrysene	1,600 J µg/kg	370 U µg/kg	4.3 × SQL
	Di-n-octylphthalate	2,500 J µg/kg	370 U µg/kg	6.8 × SQL
	Benzo(b)fluoranthene	2,300 J µg/kg	370 U µg/kg	6.2 × SQL
	Benzo(k)fluoranthene	2,400 J µg/kg	370 U µg/kg	6.5 × SQL
	Benzo(a)pyrene	1,500 J µg/kg	370 U µg/kg	4.1 × SQL
	PESTICIDES/PCBs			
	Aroclor-1254	490 J µg/kg	36 U µg/kg	13.6 × SQL
	INORGANICS			
	Barium	44.5 mg/kg	12.5 mg/kg	3.6 × REF
	Calcium	17,400 mg/kg	1,100 mg/kg	15.8 × REF
	Chromium	58.2 mg/kg	14.6 mg/kg	4.0 × REF
	Copper	63.2 mg/kg	13.7 mg/kg	4.6 × REF
	Lead	260 J mg/kg	10.7 J mg/kg	24.3 × REF
	Magnesium	10,600 mg/kg	1,740 mg/kg	6.1 × REF
	Mercury	3.1 mg/kg	0.11 UJ mg/kg	28.2 × SDL
	Silver	0.56 J mg/kg	0.45 U mg/kg	1.2 × SDL

Table 6

Summary of Analytical Results, Source/Soil Sample Analysis for McFettridge Farm Site (Continued)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments
SS-02 (cont'd)	Vanadium	57.8 mg/kg	17.3 mg/kg	3.3 × REF
	Zinc	184 mg/kg	30.9 mg/kg	6.0 × REF
SS-03 (AMM88) (MAKF63)	**SVOCs**			
	Phenanthrene	1,200 J µg/kg	330 µg/kg	3.6 × CRQL
	Fluoranthene	1,500 µg/kg	370 U µg/kg	4.0 × SQL
	Pyrene	2,200 J µg/kg	370 U µg/kg	5.9 × SQL
	Benzo(a)anthracene	770 µg/kg	370 U µg/kg	2.1 × SQL
	Benzo(b)fluoranthene	960 µg/kg	370 U µg/kg	2.6 × SQL
	Benzo(k)fluoranthene	990 µg/kg	370 U µg/kg	2.7 × SQL
	Benzo(a)pyrene	640 µg/kg	370 U µg/kg	1.7 × SQL
	Benzo(g,h,i)perylene	400 µg/kg	370 U µg/kg	1.1 × SQL
	Butylbenzylphthalate	3,400 J µg/kg	370 U µg/kg	9.2 × SQL
	Bis(2-ethylhexyl)phthalate	8,700 J µg/kg	370 U µg/kg	23.5 × SQL
	Chrysene	750 µg/kg	370 U µg/kg	2.0 × SQL
	Di-n-octylphthalate	820 J µg/kg	370 U µg/kg	2.2 × SQL
	PESTICIDES/PCBs			
	Endrin	6.4 J µg/kg	3.6 U µg/kg	1.8 × SQL
	Aroclor-1254	150 µg/kg	36 U µg/kg	4.2 × SQL
	INORGANICS			
	Barium	47 mg/kg	12.5 mg/kg	3.8 × REF
	Lead	93.2 J mg/kg	10.7 J mg/kg	8.7 × REF
	Mercury	0.25 J mg/kg	0.11 UJ mg/kg	2.3 × SDL
	Zinc	171 mg/kg	30.9 mg/kg	5.5 × REF

Table 6

Summary of Analytical Results, Source/Soil Sample Analysis for McFettridge Farm Site (Concluded)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments
SS-05 (AMM90) (MAKF65)	**PESTICIDES/PCBs**			
	4,4'-DDE	31 µg/kg	1.5 J µg/kg	20.7 × REF
	4,4'-DDT	80 µg/kg	1.2 J µg/kg	66.7 × REF
	INORGANICS			
	Arsenic	11.5 mg/kg	4.2 U mg/kg	2.7 × REF
	Lead	70.9 J mg/kg	10.7 J mg/kg	6.6 × REF

REF = Reference value.
J = Quantitation is approximate due to limitations identified during the quality control review.
U = Indicates the compound was analyzed for but not detected and reports the detection value.
UJ = The compound was analyzed for, but not detected. The associated numerical value is the estimated SQL.
CRQL = Contract Required Quantitation Limit.
PCBs = Polychlorinated Biphenyls.
SVOCs = Semivolatile Organic Compounds.
SQL = Sample Quantitation Limit.
SDL = Sample Detection Limit.
µg/kg = Micrograms per Kilogram.
mg/kg = Milligrams per Kilogram.

[33; 34]

Fifteen SVOCs, eight pesticides/PCBs, and 14 inorganic elements were detected in source/soil samples collected from the McFettridge Farm site at concentrations exceeding reference values. No VOCs were recorded above detection criteria in any of the source/soil samples collected. The following compounds and elements were detected in source/soil samples SS-01 and SS-02, collected from the debris pile area: butylbenzylphthalate, di-n-octylphthalate, barium, calcium, chromium, copper, lead, magnesium, mercury, silver, vanadium, and zinc. Two pesticides, 4,4'-DDE and 4,4'-DDT, were present in source/soil samples SS-05 and SS-01, at maximum concentrations of 31 and 1,800 ppb, respectively. In addition, Aroclor-1254 (a PCB compound) was detected in source/soil samples SS-02 and SS-03 at concentrations of 490 J and 150 ppb, respectively. Barium, lead, mercury, and zinc were detected in soil samples SS-01, SS-02, and SS-03 at maximum concentrations ranging up to 68.4, 842 J, 4.4, and 569 ppm, respectively [33; 34]. The presence of elevated levels of SVOCs, pesticides/PCBs, and inorganic elements within source/soil samples collected from the McFettridge Farm site is consistent with former waste disposal practices on the site and is likely attributable to former disposal practices.

GROUNDWATER PATHWAY

CHI/CDM characterized the subsurface geology of the site based on test pits excavated in August 1984. Subsurface geology at the site is reported to consist of 1 ft of debris underlain by approximately 2 to 3 ft of silty soil. Beneath the silty soil, a brittle, compacted glacial till, which appeared to be cemented with iron, was encountered at approximately 4 ft below ground surface (bgs). The till is approximately 2 ft thick and is underlain by a medium-to-fine, gray saturated sand [3, p. 2].

According to CHI/CDM, depth to groundwater is approximately 7 ft bgs. Based on surficial slopes and surface stream gradients, groundwater flow direction is reportedly west to east, with a slight gradient and relatively slow movement [16]. Bedrock was not encountered during the excavation of the test pits, but is believed to be between 60 and 90 ft bgs [3, pp. 1-3]. Bedrock in the vicinity of the site is mapped as Blue Hill Granite Porphyry. No bedrock formation mapped within 4-radial miles of the site exhibits Karst characteristics [18].

The Town of Millis and the surrounding Towns of Medway, Holliston, and Medfield, Massachusetts are supplied by public water supply systems, drawing water from public wells located within 4-radial miles of the McFettridge Farm site. The nearest public water supply well [redacted (b) (9)] in Holliston and serves an estimated 1,378 people [39-42].

The Town of Sherborn, which borders Millis to the north, has no public water supply system and is supplied entirely by private residential wells [39-42]. The McFettridge Farm site is located approximately 0.75 miles southeast from the Sherborn Town line. Several residential properties in the immediate vicinity of the McFettridge Farm site utilize private wells because they are beyond the limits of the Millis public water supply system [3, pp. 1-3]. The nearest private drinking water well is located on the McFettridge Farm site, on the property that is owned by Mr. McFettridge. Private groundwater supplies within 4-radial miles of the site were estimated using equal distribution calculations of U.S. Census CENTRACTS data identifying population, households, and private water wells for "Block Groups" which lie within or partially within individual radial distance rings of the McFettridge Farm site. There are an estimated 297 people served by private wells within 1-radial mile of the site, and an estimated 4,947 people are served by private wells within 4-radial miles of the site [17].

Table 7 summarizes the public groundwater supply sources within 4-radial miles of the McFettridge Farm site.

Table 7

Public Groundwater Supply Sources Within 4-Radial Miles of McFettridge Farm Site

Distance/ Direction from Site	Source Name	Location of Source[a]	Estimated Population Served	Source Type[b]
[redacted] (b) (9)		Holliston	1,378	Unknown
		Holliston	167	Unknown
		Millis	1,606	Unknown
		Medway	743	Unknown
		Millis	594	Unknown
		Medway	3,991	Unknown
		Holliston	1,795	Unknown
		Medway	4,548	Unknown
		Medfield	1,435	Unknown
		Holliston	125	Unknown
		Holliston	710	Unknown

[a]Indicates Town in which well is located.
[b]Overburden, Bedrock, or Unknown.

[39-42]

Table 8 summarizes the estimated drinking water populations served by groundwater sources within 4-radial miles of the McFettridge Farm site.

Table 8

Estimated Drinking Water Populations Served by Groundwater Sources Within 4-Radial Miles of McFettridge Farm Site

Radial Distance from McFettridge Farm Site (miles)	Estimated Population Served by Private Wells	Estimated Population Served by Public Wells	Total Estimated Population Served by Groundwater Sources Within the Ring
≥ 0.00 to 0.25	19	0	19
> 0.25 to 0.50	55	0	55
> 0.50 to 1.00	223	0	223
> 1.00 to 2.00	853	1,545	2,398

Table 8

Estimated Drinking Water Populations Served by Groundwater Sources Within 4-Radial Miles of McFettridge Farm Site (Concluded)

Radial Distance from McFettridge Farm Site (miles)	Estimated Population Served by Private Wells	Estimated Population Served by Public Wells	Total Estimated Population Served by Groundwater Sources Within the Ring
> 2.00 to 3.00	1,453	8,729	10,182
> 3.00 to 4.00	2,344	6,818	9,162
TOTAL	4,947	17,092	22,039

[17; 39; 40; 41; 42]

On 2 and 3 August 1984, CHI/CDM collected groundwater samples from wells installed in two test pits located at the sand and gravel pit (TP-4), and in the northern drum area (TP-1), respectively. The samples were analyzed for VOCs, total metals, and cyanide. Analytical results of the samples indicated that lead (0.1 milligrams per liter (mg/L) in both samples) and chromium (0.08 mg/L in TP-4 only) were above drinking water limits according to CHI/CDM. Sample results also indicated that two VOCs, ethyl benzene (28 micrograms per liter (μg/L)) and toluene (15 μg/L), were detected in groundwater sample TP-1. No VOCs were detected in groundwater sample TP-4, and no detectable levels of total cyanide were detected in either of the samples [16, p. 5].

On 22 August 1984, CHI/CDM collected groundwater samples from three monitoring wells associated with the northern drum area. The samples were analyzed for total metals, cyanide, phenol, VOCs, and BNAs. Limited analytical data are available for these samples; however, according to CHI/CDM, lead was detected at a concentration exceeding drinking water limits [16, p. 9]. Actual detected concentrations for individual samples are unknown. Phenol was reportedly detected in two of the three wells at concentrations ranging up to 215 μg/L. Two additional VOCs, ethyl benzene (40 μg/L) and toluene (53 μg/L), were detected in one of the wells. CHI/CDM reported that results indicated that the other parameters analyzed for were either below detection limits or were within "accepted limits" [16, p. 9].

In 1989, TGGE conducted photoionization detector (PID) screenings of groundwater samples collected from observation wells located on the Turk property. PID screening results indicated the presence of VOCs ranging between 0.6 and 0.8 units above background levels. GC screening of a groundwater sample collected from an observation well located in the debris pile area indicated the presence of several VOCs (probably toluene and ethyl benzene according to TGGE) [28, p. 6]. TGGE reported that a groundwater sample collected from another monitoring well located on the Turk property was sent to an analytical laboratory for VOC and TPH analyses. VOCs were not detected; however, the TPH concentration was detected at 1.2 ppm [28, p. 6].

On 15 January 1997, START personnel collected four groundwater samples (GW-01, GW-02, GW-05, and GW-06) from four monitoring wells on the McFettridge Farm site (Figure 3). Groundwater samples were analyzed through the EPA CLP for SVOCs, total metals, and cyanide. Groundwater samples were also analyzed for low level VOCs through a DAS laboratory utilizing EPA Region I Modified Method 524.2. Sample GW-01, a groundwater sample collected via hydraulic sampling equipment from the northeast corner of Plate 5, Lot 6, was utilized as the reference sample due to its upgradient location. START attempted to collect groundwater samples via hydraulic sampling equipment from two additional locations: in the western portion of the Turk property (GW-03), and along Grove Street northwest of the site (GW-04) (Figure 3). However, the well did not recharge adequately at GW-03, and refusal was encountered at GW-04; therefore, the samples could not be collected. Table 9 provides a summary of START groundwater samples collected on 15 January 1997 on and near the McFettridge Farm site.

Table 9

Sample Summary: McFettridge Farm Site
Groundwater Samples Collected by START on 15 January 1997

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Aqueous					
GW-01	AMM98 MAKF71 DAF590	1500	Grab	Between 17.5 and 29.5 feet.	Groundwater sample collected as a reference, via hydraulic sampling equipment, at 25 feet south of the intersection of Grove Street and dirt roads leading to Plate 5, Lot 7 and Plate No. 5, Lot No. 6 residences. Sample collected had a silty/cloudy/turbid appearance; PID reading (OVM) = 0 units above background.
GW-02	AMM99 MAKF72 DAF591	1030	Grab	NA	Groundwater sample collected from monitoring well on the eastern edge of potential source area (debris pile) on the Plate 13, Lot 7 section of the site, approximately 228 feet northeast of cabin, bearing north 140°. Sample collected had a clear yellow and turbid appearance; PID reading (OVM) = 0 units above background.
GW-05	AMN02 MAKF75 DAF610	1710	Grab	NA	Groundwater sample collected from monitoring well located within potential source area (debris pile) on Plate 13, Lot 7 section of the site, approximately 75 feet west of sample location GW-06, bearing north 43°. Sample collected had a dark gray and turbid appearance; (MS/MSD, for quality control); PID reading (OVM) = 0 units above background.

Table 9

Sample Summary: McFettridge Farm Site
Groundwater Samples Collected by START on 15 January 1997
(Concluded)

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
GW-06	AMN03 MAKF76 DAF611	1215	Grab	NA	Groundwater sample collected from monitoring well, located on the eastern edge of potential source area (debris pile) on Plate 7, Lot 7 section of the site, approximately 75 feet east of sample location GW-05, bearing north 267°. Sample collected had a dark gray and turbid appearance; PID reading (OVM) = 0 units above background.

MS/MSD = Matrix Spike/Matrix Spike Duplicate
PID = Photoionization Detector
OVM = Organic Vapor Meter
NA = Not Applicable

[35]

Table 10 is a summary of organic compounds and inorganic elements detected through CLP and DAS analyses of START groundwater samples. As previously mentioned in the waste/source sampling section, for each sample location, a compound or element is listed if it is detected at three times or greater than the reference sample concentration (GW-01). However, if the compound or element is not detected in the reference sample, the reference sample's SQL or SDL is used as the reference value. These compounds or elements are listed if they occur at a value equal to or greater than the reference sample's SQL or SDL and are designated by their approximate relative concentration above these values. During data validation, pesticide/PCB sample results for sample GW-05 were rejected due to sample contamination which interfered with pesticide/PCB identification and quantification [31].

Complete analytical results of START groundwater samples including quantitation and detection limits are presented in Attachment B. Sample results quantified with a "J" on analytical tables are considered approximate because of limitations identified during CLP and DAS data validation. In addition, organic sample results reported at concentrations below quantitation limits and confirmed by mass spectrometry are also qualified by a "J" and considered approximate [31; 32].

Table 10

Summary of Analytical Results, Groundwater Sample Analysis for McFettridge Farm Site

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments
GW-02 (AMM99) (MAKF72) (DAF591)	**INORGANICS**			
	Calcium	56,400 µg/L	12,200 µg/L	4.6 × REF
	Chromium	6.1 J µg/L	2.0 UJ µg/L	3.1 × SDL
	Iron	15,600 µg/L	4,590 µg/L	3.4 × REF
	Manganese	329 µg/L	63.7 µg/L	5.2 × REF
	Potassium	6,200 µg/L	1,500 µg/L	4.1 × REF
	Sodium	10,600 µg/L	2,370 µg/L	4.5 × REF
	Vanadium	13.7 µg/L	3.6 µg/L	3.8 × REF
GW-05 (AMN02) (MAKF75) (DAF610)	**VOCs**			
	Trichloroethene	1.4 µg/L	1.0 UJ µg/L	1.4 × SQL
	m/p-Xylene	30 J µg/L	1.0 UJ µg/L	30 × SQL
	o-Xylene	2.4 J µg/L	1.0 UJ µg/L	2.4 × SQL
	Isopropylbenzene	3.7 J µg/L	1.0 UJ µg/L	3.7 × SQL
	n-Propylbenzene	3.3 J µg/L	1.0 UJ µg/L	3.3 × SQL
	1,3,5-Trimethylbenzene	6.3 J µg/L	1.0 UJ µg/L	6.3 × SQL
	p-Isopropyltoluene	1.6 J µg/L	1.0 UJ µg/L	1.6 × SQL
	1,2,4-Trimethylbenzene	13 J µg/L	1.0 UJ µg/L	13 × SQL
	tert-Butylbenzene	2.9 J µg/L	1.0 UJ µg/L	2.9 × SQL
	n-Butylbenzene	1.5 J µg/L	1.0 UJ µg/L	1.5 × SQL
	SVOCs			
	2,4-Dimethylphenol	10 J µg/L	10 U µg/L	1 × SQL
	Naphthalene	5.5 J µg/L	1.0 UJ µg/L	5.5 × SQL
	INORGANICS			
	Barium	314 µg/L	21.1 µg/L	3.1 × REF
	Calcium	146,000 µg/L	12,200 µg/L	12 × REF
	Cobalt	16.3 µg/L	2.5 U µg/L	6.5 × SDL
	Cyanide	20.3 µg/L	7.0 U µg/L	2.9 × SDL

Table 10

Summary of Analytical Results, Groundwater Sample Analysis for McFettridge Farm Site (Concluded)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments
GW-05 (concl.)	Iron	52,100 µg/L	3,360 µg/L	15.5 × REF
	Lead	78.6 µg/L	2.8 J µg/L	28.1 × REF
	Magnesium	16,200 µg/L	4,290 µg/L	3.8 × REF
	Manganese	724 µg/L	63.7 µg/L	11.4 × REF
	Mercury	3.8 µg/L	0.2 U µg/L	19 × SDL
	Nickel	42.8 µg/L	3.0 U µg/L	14.3 × SDL
	Potassium	5,990 µg/L	1,500 µg/L	4 × REF
	Vanadium	13.3 µg/L	3.6 µg/L	3.7 × REF
	Zinc	555 µg/L	15.9 U µg/L	34.9 × SDL
GW-06 (AMN03) (MAKF76) (DAF611)	**PESTICIDES**			
	4,4'-DDD	0.73 µg/L	0.10 U µg/L	7.3 × SQL
	4,4'-DDT	0.58 µg/L	0.10 U µg/L	5.8 × SQL
	INORGANICS			
	Barium	102 µg/L	21.1 µg/L	4.8 × REF
	Calcium	87,100 µg/L	12,200 µg/L	7.1 × REF
	Cobalt	6.0 µg/L	2.5 U µg/L	2.4 × SDL
	Lead	18.2 µg/L	2.8 J µg/L	6.5 × REF
	Magnesium	22,900 µg/L	4,290 µg/L	5.3 × REF
	Manganese	618 µg/L	63.7 µg/L	9.7 × REF
	Mercury	0.91 µg/L	0.2 U µg/L	4.6 × SDL
	Nickel	5.5 J µg/L	3.0 U µg/L	1.8 × SDL
	Zinc	381 µg/L	15.9 U µg/L	15.9 × REF

REF = Reference value.
J = Quantitation is approximate due to limitations identified during the quality control review.
U = Indicates the compound was analyzed for but not detected and reports the detection value.
UJ = The compound was analyzed for, but not detected. The associated numerical value is the estimated SQL or SDL.
VOCs = Volatile Organic Compounds.
SVOCs = Semivolatile Organic Compounds.
SQL = Sample Quantitation Limit.
SDL = Sample Detection Limit.
µg/L = Micrograms per Liter.

[31; 32]

Analytical results of START groundwater samples indicated the presence of 10 VOCs, two SVOCs, two pesticides, and 15 inorganic elements throughout the site. Sample GW-05, collected from the monitoring well located in the debris pile in the northern portion of the site, was the only groundwater sample in which VOCs and SVOCs were detected; in addition, 13 inorganic elements were also detected above detection criteria in sample GW-05. VOCs in sample GW-05 were detected at concentrations ranging from 1.4 μg/L (trichloroethene) to 30 J μg/L (m/p-xylene). Two SVOCs, 2,4-dimethylphenol and naphthalene, were detected above detection criteria at 5.5 and 10 μg/L, respectively. Inorganic elements detected in sample GW-05 ranged in concentrations from 3.8 μg/L (mercury) to 146,000 μg/L (calcium). Sample GW-06 was the only groundwater sample to contain pesticides, 4,4'-DDD and 4,4'-DDT. Nine inorganic elements were also detected in sample GW-06 at concentrations exceeding reference values. The two pesticides and nine inorganic contaminants detected in GW-06 were also detected at elevated concentrations in soil samples collected from the site by START. Additionally, sample GW-02 contained seven inorganic elements above detection criteria [31-34]. Several of the elements detected in sample GW-02 were also detected in other soil and groundwater samples collected on the site. Analytical results of START groundwater samples are consistent with past disposal practices at the site.

On 15 January 1997, START personnel also collected four residential well samples (RW-01 through RW-04) from three nearby residences (Figure 3). Sample RW-01 and a replicate sample, RW-02, were collected from a residential well located at 63 Grove Street (Plate 5, Lot 7). Sample RW-03 was collected from a residential well located at 53 Grove Street (Plate 5, Lot 6). Sample RW-04 was collected from a residential well located at 43 Grove Street (Plate 5, Lot 23). Residential well samples were analyzed through the EPA CLP for VOCs, SVOCs, pesticides/PCBs, total metals, and cyanide. Residential well samples were also analyzed for low level VOCs (EPA Method 524.2) through a DAS laboratory. QA/QC consisted of the collection of a trip blank and a replicate sample of RW-01 (RW-02). Sample RW-04 was established as the residential well reference sample. Table 11 summarizes START residential well samples collected on 15 January 1997 from nearby residences.

Table 11

Sample Summary: McFettridge Farm Site
Residential Well Samples Collected by START on 15 January 1997

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Aqueous					
RW-01	AMN04 MAKF77 DAF584	0950	Grab	NA	Residential water sample collected from a sample tap at Plate No. 5, Lot 7 residence; PID reading (OVM) = 0 units above background.
RW-02	AMN05 MAKF78 DAF585	0950	Grab	NA	Replicate of RW-02 for quality control.

Table 11

Sample Summary: McFettridge Farm Site
Residential Well Samples Collected by START on 15 January 1997
(Concluded)

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Aqueous (Cont'd)					
RW-03	AMN06 MAKE99 DAF586	1045	Grab	NA	Residential water sample collected from a sample tap at Plate 5, Lot 6 residence; PID reading (OVM) = 0 units above background.
RW-04	AMN07 MAKF00 DAF587	1055	Grab	NA	Residential water (reference) sample collected from a sample tap at the Lot 23 residence; PID reading (OVM) = 0 units above background.

MS/MSD = Matrix Spike/Matrix Spike Duplicate
PID = Photoionization Detector.
OVM = Organic Vapor Meter.
NA = Not Applicable.

[35]

Table 12 is a summary of organic compounds and inorganic elements detected through CLP and DAS analyses of START residential well samples. For each sample location, a compound or element is listed if it is detected at three times or greater than the reference sample concentration (RW-04). However, if the compound or element is not detected in the reference sample, the reference sample's SQL or SDL is used as the reference value. These compounds or elements are listed if they occurred at a value equal to or greater than the reference sample's SQL or SDL and are designated by their approximate relative concentration above these values.

Table 12 also lists Maximum Contaminant Levels (MCLs) established by EPA for those substances. According to EPA safe drinking water guidelines (Superfund Chemical Data Matrix, June 1996), the concentrations of 1,1,1-trichloroethane (TCA), trichloroethene (TCE), and benzene in the residential well samples did not exceed their respective MCL values of 5 μg/L, 200 μg/L, and 5 μg/L [21; 31; 32]. MCLs have not been established for the other substances detected during the START sampling of nearby residential wells [21; 31; 32].

Complete analytical results of START residential well samples including quantitation and detection limits are presented in Attachment B. Sample results quantified with a "J" on analytical tables are considered approximate because of limitations identified during CLP or DAS data validation. In addition, organic sample results reported at concentrations below quantitation limits and confirmed by mass spectrometry are also qualified by a "J" and considered approximate [31; 32].

Table 12

Summary of Analytical Results, Residential Well Sample Analysis for McFettridge Farm Site

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	MCL	Comments
RW-01 (AMN04) (MAKF77) (DAF584)	**VOCs**				
	Trichloroethene	1.3 J µg/L	1.0 UJ µg/L	5 µg/L	1.3 × SQL
	INORGANICS				
	Manganese	346 µg/L	3.9 U µg/L	NL	88.7 × SDL
RW-02 (AMN05) (MAKF78) (DAF585)	**VOCs**				
	Trichloroethene	1.4 J µg/L	1.0 UJ µg/L	5 µg/L	1.4 × SQL
	INORGANICS				
	Manganese	354 µg/L	3.9 U µg/L	NL	90.8 × SDL
RW-03 (AMN06) (MAKE99) (DAF586)	**VOCs**				
	1,1,1-Trichloroethane	1.1 J µg/L	1.0 UJ µg/L	200 µg/L	1.1 × SQL
	Benzene	1.3 J µg/L	1.0 UJ µg/L	5 µg/l	1.3 × SQL
	INORGANICS				
	Magnesium	10,400 µg/L	3,640 µg/L	NL	3.0 × REF
	Manganese	1,020 µg/L	3.9 U µg/L	NL	261.5 × SDL

REF = Reference Value.
J = Quantitation is approximate due to limitations identified during the quality control review.
U = Indicates the compound was analyzed for but not detected and reports the detection value.
UJ = The compound was analyzed for, but not detected. The associated numerical value is the estimated SQL.
VOCs = Volatile Organic Compounds.
SQL = Sample Quantitation Limit.
SDL = Sample Detection Limit.
µg/L = Micrograms per Liter.
NL = Not listed in Superfund Chemical Data Matrix (1996).
MCL = Maximum Contaminant Level (from Superfund Chemical Data Matrix (1996)).

[31; 32]

Analytical results of START residential well samples indicated that both residential wells sampled and compared against the reference well (RW-04) had elevated levels of VOCs and inorganic elements; however, all of the concentrations detected were below their MCLs [21; 31-24]. Samples RW-01 and RW-02 (replicate), both collected from a single well, indicated a very high detection correlation. Manganese was detected in three of the residential well samples at a

maximum concentration of 1,020 μg/L (RW-03). Trichloroethene was detected in samples RW-01 and RW-02 at concentrations of 1.3 J and 1.4 J μg/L, respectively. 1,1,1-Trichloroethane and benzene were detected in sample RW-03 at concentrations of 1.1 J and 1.3 J μg/L, respectively. Magnesium was also detected in sample RW-03 at a concentration of 10,400 μg/L, three times the background (reference) concentration. Analytical results of START residential well samples are consistent with past disposal practices on the site.

A release of VOCs, SVOCs, pesticides, and inorganic elements to the groundwater pathway has been documented through START sampling of on-site monitoring wells and nearby residential wells. Two nearby residences with two and three inhabitants, respectively, have been impacted; however, the concentrations of contaminants detected in the residential wells are below MCL values.

SURFACE WATER PATHWAY

The topography of the McFettridge Farm site is generally flat, sloping gently to the east, with an average elevation of 150 ft above mean sea level. The McFettridge Farm site is located in an area of minimal flooding (Zone C) outside the 500-year flood stage boundary [19]. Stormwater and overland runoff from the site flows east before entering the Bogastow Brook, located approximately 0.1 miles northeast of the site [35, pp. 1-5].

The 15-mile downstream surface water pathway begins at the probable point of entry (PPE) along Bogastow Brook. The Bogastow Brook flows approximately 5 miles east to its confluence with Charles River. From this location, the surface water pathway continues north along the Charles River for the remaining 10 miles, through the Medfield State Forest, to the 15-mile downstream surface water pathway terminus, located approximately 0.25 miles south of Charles Street in Dover, Massachusetts [36-38].

There are no known records of flow rates for the Bogastow Brook. Based on observations and relative sizes of nearby rivers and streams, as represented on relevant U.S. Geological Survey (USGS) topographic maps, the estimated flow for Bogastow Brook is between 10 and 100 cubic feet per second (cfs) [36-38]. Flow characteristics for the Charles River are based on USGS information obtained from USGS Gaging Station No. 01103500 [27, pp. 76-77]. The gaging station is located approximately 1.3 miles northeast of the intersection of Center and Walpole Streets in Dover, Massachusetts, which is approximately 18 miles downstream of the McFettridge Farm site [36-38]. No known gaging stations are located along the 15-mile downstream surface water pathway from the McFettridge Farm site [27]. The Charles River (as measured at Gaging Station No. 01103500) has an average long-term flow rate of 305 cfs. The flow rate of Charles River along the 15-mile surface water pathway is assumed to be between 100 and 305 cfs. Table 13 summarizes surface water bodies along the 15-mile downstream surface water pathway.

Table 13

Surface Water Bodies Along the 15-Mile Downstream Pathway from McFettridge Farm Site

Surface Water Body	Descriptor[a]	Length of Reach	Flow Characteristics (cfs)[b]	Length of Wetland Frontage (miles)
Bogastow Brook	Small to moderate stream	5 miles	10-100 cfs	3.75
Charles River	Moderate to large stream	10 miles	>100-305 cfs	5.75

[a] Minimal stream <10 cfs. Small to moderate steam 10-100 cfs. Moderate to large stream >100-1,000 cfs. Large stream to river >1,000-10,000 cfs. Large river >10,000-100,000 cfs. Very large river >100,000 cfs. Coastal tidal waters (flow not applicable). Shallow ocean zone or Great Lake (flow not applicable). Moderate depth ocean zone or Great Lake (flow not applicable). Deep ocean zone or Great Lake (flow not applicable). Three-mile mixing zone in quiet flowing river 10 cfs or greater.

[b] Cubic feet per second.

[27; 43; 44; 45; 46]

Based on the information obtained by START, there are no known surface water intakes used for public drinking water supplies along the 15-mile downstream pathway from the site [39-42]. There are an estimated 9.5 miles of wetland frontage along the 15-mile downstream surface water pathway [43-46]. There is one habitat along the 15-mile downstream pathway known to be utilized by a Commonwealth of Massachusetts-listed State-threatened species, which is also co-listed as a Federal-threatened candidate species. No additional sensitive environments are known to exist along the 15-mile downstream surface water pathway.

According to the Massachusetts Division of Fisheries and Wildlife, Bogastow Brook and the Charles River are considered recreational fishing water bodies, except in those areas where the land along the river banks is posted as privately owned [20].

Bogastow Brook, from Millis to its confluence with Charles River, is a silty, warm water stream with no known rare or endangered fish. Aquatic species reported to inhabit this section of the brook include American Eel, Bluegill, Brown Bullhead, Large-mouth Bass, Pumpkinseed, Golden Shiner, Redfin Pickerel, Chain Pickerel, Creekchub sucker, Yellow Bullhead, Red-breasted Sunfish, Black Crappie, Carp, and Fallfish [22].

The portion of Charles River along the 15-mile surface water pathway is stocked with trout in early spring; this creates a "put- and take-trout fishery." Species reported to inhabit this section of the river include Bluegill, Brown Bullhead, Yellow Bullhead, Large-mouth Bass, Pumpkinseed, Bridled Shiner, Redfin Pickerel, Chain Pickerel, Yellow Perch, Red-breasted Sunfish, Branded Sunfish, and Black Crappie [22].

Table 14 summarizes sensitive environments along the 15-mile downstream pathway from the McFettridge Farm site.

Table 14

Sensitive Environments Along the 15-Mile Downstream Pathway from McFettridge Farm Site

Sensitive Environment Type	Surface Water Body	Downstream Distance From PPE (miles)	Flow Rate at Environment (cfs)
Clean Water Act	Bogastow Brook	0.1	10-100
State-Threatened Species Habitat*	Bogastow Brook	2-3	10-100
Wetland (3.75 miles frontage)	Bogastow Brook	0-5	10-100
Wetland (5.75 miles frontage)	Charles River	5-15	> 100-305

* Co-listed as a Federal-threatened species candidate
PPE = Probable Point of Entry
cfs = Cubic feet per second

[22; 42; 43; 44; 45]

On 1 August 1984, CHI/CDM collected a surface water grab sample from a wetland area north of the north drum area. The sample was analyzed for VOCs, total metals, and cyanide. According to CHI/CDM, lead, chromium, and mercury concentrations exceeded drinking water limits [16, p. 5]. Lead was detected at a concentration of 1.4 mg/L. Two VOCs (ethyl benzene at 112 mg/L and toluene at 31 mg/L) were detected [16, p. 5]. Cyanide was not detected. Information regarding the analytical methods for this sampling round was unavailable to START.

On 15 January 1997, START personnel collected a total of six sediment samples (SD-01 to SD-06) from Bogastow Brook and wetlands near Bogastow Brook. Samples SD-06 and SD-04/05 are utilized as the reference samples for SD-01/02 and SD-03, respectively, because of their lithological properties and upstream locations relative to source areas on the site. The sediment samples were analyzed through EPA CLP analyses for VOCs, SVOCs, pesticides/PCBs, total metals, and cyanide. QA/QC consisted of the collection of a duplicate sample (SD-02), a trip blank, and a rinsate blank [35, pp. 6-9]. Table 15 summarizes sediment samples collected by START personnel.

Table 15

Sample Summary: McFettridge Farm Site
Sediment Samples Collected by START on 15 January 1997

Sample Location No.	Traffic Report No.	Time (hrs)	Remarks	Sample Depth	Sample Source
MATRIX: Soil					
SD-01	AMM91 MAKF66	1520	Grab	0 to 16 inches	Sediment sample collected from wetlands off of Bogastow Brook, approximately 654 feet north of cabin, bearing north 242°. The material is black, silty, organic-rich, and gelantinous; PID reading (OVM) = 0 units above background.
SD-02	AMM92 MAKF67	1520	Grab	0 to 16 inches	Duplicate of SD-01 for quality control.
SD-03	AMM93 MAKF68	1610	Grab	0 to 16 inches	Sediment sample collected along the Bogastow Brook, approximately 268 feet east of GW-05, bearing north 186°. The material is black clay-silt with minor fine sand layers and organic debris; PID reading (OVM) = 0 units above background.
SD-04	AMM94 MAKF69	1430	Grab	0 to 16 inches	Sediment sample collected as a reference along the Bogastow Brook, approximately 101 feet south of culvert bridge, bearing north 46°. The material is medium brown silty fine sand with traces of clay and organics; PID reading (OVM) = 0 units above background.
SD-05	MAKF70	1620	Grab	0 to 16 inches	Sediment sample collected as a metals only reference along the Bogastow Brook, approximately 10 feet south of SD-04, bearing north 167°. The material is medium brown silty fine sand with traces of clay and organics; PID reading (OVM) = 0 units above background.
SD-06	AMN17 MAKG48	1750	Grab	0 to 16 inches	Sediment sample collected as a reference from wetlands north of potential source area (debris pile) on the Plate 5, Lots 4 and 6-6 sections of the site. The material is medium brown/black organic debris and sandy silt with minor clay; PID reading (OVM) = 0 units above background.

MS/MSD = Matrix Spike/Matrix Spike Duplicate.
OVM = Organic vapor meter.
PID = Photoionization detector.

[35]

Table 16 is a summary of organic compounds and inorganic elements detected through CLP analyses of START sediment samples. For each sample location, a compound or element is listed if it is detected at three times or greater than the reference sample concentration (SD-06 or SD-04/05). However, if the compound or element is not detected in the reference sample(s), the reference sample's SQL or SDL is used as the reference value. These compounds or elements are listed if they occurred at a value equal to or greater than the reference sample's SQL or SDL and are designated by their approximate relative concentration above these values.

Complete analytical results of START sediment samples including quantitation and detection limits are presented in Attachment A. Sample results quantified with a "J" on analytical tables are considered approximate because of limitations identified during CLP data validation. In addition, organic sample results reported at concentrations below quantitation limits and confirmed by mass spectrometry are also qualified by a "J" and considered approximate [33; 34]. During data validation, VOCs, SVOCs, and pesticides/PCBs non-detected results were rejected ("R") and positive results were estimated ("J") since percent moisture criteria were not met [33].

Table 16

Summary of Analytical Results,
Sediment Sample Analysis for McFettridge Farm Site

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments
SD-01 (AMM91) (MAKF67)	**PESTICIDES/PCBs**			
	4,4'-DDE	18 J µg/kg	1.6 J µg/kg	11.3 × REF
	4,4'-DDT	9.4 J µg/kg	0.61 J µg/kg	15.4 × REF
	INORGANICS			
	Barium	67.5 J mg/kg	14.4 mg/kg	4.5 × REF
	Beryllium	0.80 J mg/kg	0.37 UJ mg/kg	2.2 × SDL
	Calcium	6,290 J mg/kg	686 mg/kg	9.2 × REF
	Chromium	28.7 J mg/kg	6.9 J mg/kg	4.2 × REF
	Cobalt	6.2 J mg/kg	0.79 mg/kg	7.8 × REF
	Iron	9,750 J mg/kg	924 mg/kg	10.6 × REF
	Magnesium	2,640 J mg/kg	197 mg/kg	13.4 × REF
	Manganese	148 J mg/kg	14.7 J mg/kg	10.1 × REF
	Potassium	398 J mg/kg	129 mg/kg	3.1 × REF

Table 16

Summary of Analytical Results, Sediment Sample Analysis for McFettridge Farm Site (Concluded)

Sample Location	Compound/ Element	Sample Concentration	Reference Concentration	Comments
SD-01 (concl.)	Sodium	366 J mg/kg	170 U mg/kg	2.2 × SDL
	Vanadium	28.2 J mg/kg	4.8 J mg/kg	5.9 × REF
	Zinc	36.1 J mg/kg	17.1 UJ mg/kg	2.1 × SDL
SD-02 (AMM92) (MAKF67)	**PESTICIDES/PCBs**			
	4,4'-DDE	13 J µg/kg	1.6 J µg/kg	8.1 × REF
	4,4'-DDD	6.1 J µg/kg	2.0 J µg/kg	3.1 × REF
	4,4'-DDT	12 J µg/kg	0.61 J µg/kg	19.7 × REF
	INORGANICS			
	Barium	74.1 J mg/kg	14.4 mg/kg	5.1 × REF
	Beryllium	0.94 J mg/kg	0.37 UJ mg/kg	2.5 × SDL
	Calcium	7,180 J mg/kg	686 mg/kg	10.5 × REF
	Chromium	27.5 J mg/kg	6.9 J mg/kg	4.0 × REF
	Cobalt	4.3 J mg/kg	0.79 mg/kg	5.4 × REF
	Copper	29.7 J mg/kg	9.6 J mg/kg	3.1 × REF
	Iron	9,440 J mg/kg	924 mg/kg	10.2 × REF
	Magnesium	1,930 J mg/kg	197 mg/kg	9.8 × REF
	Manganese	80.4 J mg/kg	14.7 J mg/kg	5.5 × REF
	Sodium	371 J mg/kg	170 U mg/kg	2.2 × SDL
	Vanadium	20.7 J mg/kg	4.8 J mg/kg	4.3 × REF
	Zinc	30.7 J mg/kg	17.1 UJ mg/kg	1.8 × SDL

REF = Reference value.
J = Quantitation is approximate due to limitations identified during the quality control review.
U = Indicates the compound was analyzed for but not detected and reports the detection value.
UJ = The compound was analyzed for, but not detected. The associated numerical value is the estimated SQL or SDL.
VOCs = Volatile Organic Compounds.
PCBs = Polychlorinated Biphenyls.
SQL = Sample Quantitation Limit.
µg/kg = Micrograms per Kilogram.
mg/kg = Milligrams per Kilogram.
SDL = Sample Detection Limit.

[33; 34]

Analytical results of START sediment samples collected from wetlands off of Bogastow Brook indicated elevated concentrations of pesticides and several inorganics. Samples SD-01/02 contained a total of three pesticides at concentrations ranging from 6.1 J to 18 J μg/kg. Twelve inorganic elements were detected in sample SD-01 at concentrations ranging from 0.80 J to 9,750 J mg/kg. Sample SD-02 (duplicate sample of SD-01) contained 12 inorganic elements ranging in concentration from 0.94 J to 9,440 J mg/kg. Sample SD-03 was the most downstream sediment sample collected along Bogastow Brook; however, the upstream (reference) samples SD-04/05 contained higher concentrations of the pesticides and inorganic contaminants detected in SD-03. Therefore, no release to Bogastow Brook from the McFettridge Farm site could be documented.

START could not determine the source of the upstream contamination; however, information provided by Mr. Graci documents a spill of gasoline to Bogastow Brook upstream of the McFettridge Farm site [51, Attachment D]. In addition, it should be noted that a golf course is located immediately upstream of the confluence of Bogastow Brook and the unknown stream.

The pesticides and inorganic elements (except beryllium) detected in sediment samples were also detected in source/soil samples collected from the site or in the on-site groundwater monitoring wells [33; 34]. Therefore, START considered the contaminants detected in wetlands sediment samples to potentially be partially attributable to past disposal practices at the McFettridge Farm site.

START performed sediment sampling as part of the McFettridge Farm property SIP. No other surface water pathway sampling is known to have been conducted for the McFettridge Farm property SIP. Based on the START analytical results, a release of hazardous substances from on-site sources to wetlands along the McFettridge Farm site surface water pathway has been documented. However, contamination in Bogastow Brook could not be attributed to the McFettridge Farm property since higher concentrations of contaminants from unknown source(s) were detected upstream of the property.

SOIL EXPOSURE PATHWAY

An estimated 1,718 people live within 1-radial mile of the site, and an estimated 34,802 people live within 4-radial miles of the site [17]. The nearest residence is the McFettridge residence, located approximately 40 ft west of the northern drum area. Currently, three people are known to live at this residence [33; 34; 35, pp. 1-5].

There are no known schools or day-care facilities located within 200 ft of areas of observed contamination on the McFettridge Farm site. Two on-site employees work periodically on the portion of the site owned by Mr. Turk. No known terrestrial sensitive environments are located on the McFettridge Farm site [35, pp. 1-5].

On 4 September 1984, a composite sample was collected by CHI/CDM from material contained within a soil pile in the vicinity of the northern drum area. The sample was analyzed for EP Tox metals, flashpoint, oil, grease, and total solids. Analytical results of the sample indicated that the metals did not exceed EP Tox regulatory limits; flashpoint was shown to be greater than 200°F, and the sample contained 1.25% oil and grease [16, p. 11].

On 29 March 1989, TGGE conducted head-space screenings for total VOCs on soil samples collected from borings on the Turk portion of the site. VOC headspace screening results indicated PID readings ranging between 0.7 and 2.2 units above background for samples collected from depths of 0 to 2 feet [28].

On 15 January 1997, START personnel collected five surface soil samples from the McFettridge Farm site which were submitted for VOC, SVOC, pesticide/PCB, total metals, and cyanide analyses through the EPA CLP. Analytical results for START soil samples collected from the McFettridge Farm site are summarized and discussed in the waste/source section of this report.

START soil sampling on the McFettridge Farm property documented a release of hazardous substances from on-site sources to surficial soils in the vicinity of the McFettridge residence, impacting three residents. Since the sampling event, no known actions have been taken to address the release to surficial soils.

AIR PATHWAY

The nearest individuals to known areas of contamination are three residents inhabiting the McFettridge dwelling located approximately 40 ft west of the northern drum area. An estimated 1,718 and 34,802 people reside within 1- and 4-radial miles of the site, respectively [17]. Table 17 summarizes the estimated population within 4-radial miles of the McFettridge Farm site.

Table 17

Estimated Population Within 4-Radial Miles of McFettridge Farm Site

Radial Distance from McFettridge Farm Site (miles)	Estimated Population
On a Source	3
> 0.00 to 0.25	47
> 0.25 to 0.50	259
> 0.50 to 1.00	1,409
> 1.00 to 2.00	6,869
> 2.00 to 3.00	13,789
> 3.00 to 4.00	12,426
TOTAL	34,802

[17]

One State-threatened species (Class Reptilia) is known to use habitats located within 4-radial miles of the McFettridge Farm site [20]. This species is co-listed as a Federal-threatened species candidate. An estimated 4,450 acres of wetlands exist within 4-radial miles of the McFettridge Farm site [43-46]. Table 18 summarizes sensitive environments located within 4-radial miles of the McFettridge Farm site.

Table 18

Sensitive Environments Located Within 4-Radial Miles of McFettridge Farm Site

Radial Distance from McFettridge Farm Site (miles)	Sensitive Environment/Species (status)
On a Source	None
> 0.00 to 0.25	39 acres wetlands
	CWA-protected water body
> 0.25 to 0.50	67 acres wetlands
> 0.50 to 1.00	329 acres wetlands
> 1.00 to 2.00	920 acres wetlands
> 2.00 to 3.00	1,318 acres wetlands
	Habitat for one Federal threatened species candidate
> 3.00 to 4.00	1,774 acres wetlands

CWA = Clean Water Act.

[20; 43-46]

During the 15 January 1997 START on-site sampling event, START conducted ambient air monitoring for health and safety purposes. No ambient air measurements were recorded above background levels by air monitoring instruments [photoionization detector/flame ionization detector (PID/FID)] [35, pp. 1-9].

No laboratory qualitative air samples are known to have been collected from the McFettridge Farm property. Based on available data, no release of hazardous substances to the ambient air from on-site sources is known or suspected to have occurred, and no impacts to nearby residential populations or sensitive environments are known or suspected via airborne transmission.

SUMMARY

The McFettridge Farm site is located on Grove Street in Millis, Norfolk County, Massachusetts. According to the Town of Millis Tax Assessor's Map, the McFettridge Farm site encompasses approximately 5 to 10 acres, and corresponds with Plate 5, Lots 4, 6-6, and 7; and Plate 13, Lot 7. One acre of the site (Plate 5, Lot 7) is owned by Mr. Arthur McFettridge. The McFettridge Farm site allegedly includes portions of the adjacent properties owned by Mr. Robert Graci, Mr. Domenic Tiberi, and Mr. Steven Turk. At the present time, no known land survey of the site has been conducted in order to determine the exact location of the site relative to the properties on which it is situated. Consequently, property lines in areas of concern are presently under dispute by the aforementioned property owners.

The McFettridge Farm site and surrounding area is zoned for residential use. The site is bound to the north by Orchard Street and an unnamed stream, to the south by a horse farm and residential properties along Causeway Street, to the east by Bogastow Brook, and to the west by residential properties along Grove Street.

The site is accessible to the public. There are an estimated 1,718 people living within 1-radial mile of the site, and 34,802 people living within 4-radial miles of the site. The nearest residence is the McFettridge residence on the site, located approximately 40 feet west of the northern drum area. There are no known schools or day-care facilities located within 200 feet of areas of observed contamination on the McFettridge Farm site.

Based on Massachusetts Department of Environmental Protection [MA DEP, previously the Massachusetts Department of Environmental Quality Engineering (MA DEQE)] file information, the site was used as a disposal area by McFettridge, Inc., a trash collection service in Millis owned by Mr. McFettridge. The dumping reportedly occurred without knowledge or consent from the other property owners. Wastes were disposed of on the site for approximately 15 years and included paints, pigments and dyes, latex, linoleum, oil, oil-contaminated soil, aqueous organics, ammonia, and other sludges, along with other flammable liquids and solids.

In 1984, MA DEQE assigned their emergency response contractor, Clean Harbors, Inc., in conjunction with Camp Dresser & McKee, and Allied Analytical and Research Laboratory (a division of Chemical Waste Management of Massachusetts, Inc.) to initiate remedial activities on the McFettridge Farm site. According to MA DEQE file information, remedial activities at the site began on 1 August 1984. Approximately 1,800 drums and 60 cubic yards of contaminated soil were removed from the McFettridge Farm site for off-site disposal. In addition, approximately 50 drums and 5,000 cubic yards of rubbish and soil were left to remain on site.

Subsequent investigations conducted at the McFettridge Farm site by contractors for MA DEP included the installation of five monitoring wells, excavation of seven test pits, and the collection of soil and groundwater samples on and around the McFettridge Farm site. Analysis of soil and groundwater samples indicated contamination with volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals.

On 15 January 1997, Roy F. Weston, Inc. (WESTON®) Superfund Technical Assessment and Response Team (START) personnel conducted sampling activities at the McFettridge Farm site. A total of 19 samples were collected from source/soil, sediment, residential well, and groundwater locations on and near the site. START samples were submitted for VOCs, SVOCs, pesticides/polychlorinated biphenyles (PCBs), and inorganics (total metals, and cyanide) analyses through the EPA Contract Laboratory Program (CLP). START groundwater and residential well samples were also analyzed through a Delivery of Analytical Services (DAS) laboratory for low level VOCs by EPA Modified Method 524.2.

Fifteen SVOCs, eight pesticides/PCBs, and 14 inorganic elements were detected in source/soil samples collected from the McFettridge Farm site. No VOCs were recorded above detection criteria in any of the source/soil samples collected. Analytical results of START groundwater samples collected from on-site monitoring wells indicated the presence of 10 VOCs, two SVOCs, two pesticides, and 15 inorganic elements exceeding reference values. Drinking water samples collected from nearby residences contained three VOCs and two inorganic elements at concentrations below maximum contaminant levels (MCLs) established by the Environmental Protection Agency (EPA) for municipal drinking water supplies.

The 15-mile downstream surface water pathway begins at the probable point of entry, located approximately 0.1 mile northeast of the site, at Bogastow Brook. Bogastow Brook flows approximately 5 miles east to the confluence of Bogastow Brook and Charles River. The surface water pathway continues north along the Charles River for the remaining 10 miles through the Medfield State Forest and South Natick, Massachusetts to the 15-mile surface water downstream pathway terminus, located approximately 0.25 miles south of Charles Street in Dover, Massachusetts. Based on analytical results for START sediment sampling, a release of hazardous substances from on-site sources to wetlands along the McFettridge Farm site surface water pathway has been documented. However, contamination in Bogastow Brook could not be attributed to the McFettridge Farm property since higher concentrations of contaminants from unknown source(s) were detected upstream of the property.

One State-threatened species (also co-listed as a Federal-threatened candidate species) is known to use habitats located within 4-radial miles of the McFettridge Farm site. An estimated 4,450 acres of wetlands are known to exist within 4-radial miles of the McFettridge Farm site.

Analytical results for the 15 January 1997 START sampling event documented a release of hazardous materials (at least partially attributable to on-site sources) to the groundwater pathway, wetlands along the surface water pathway, and soil exposure pathway.

McFETTRIDGE FARM SITE
REFERENCES

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[6] Millis Board of Health. 1983. Letter to Mr. Arthur McFettridge, property owner, RE: Removal of waste from property. 30 June.

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McFETTRIDGE FARM SITE
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ATTACHMENT A

MCFETTRIDGE FARM

SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS START

Samples collected 15 January 1997

ATTACHMENT B

MCFETTRIDGE FARM

GROUNDWATER AND RESIDENTIAL WELL SAMPLE ANALYTICAL RESULTS START

Samples collected 15 January 1997